

## **3.0      AFFECTED ENVIRONMENT**

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This chapter describes the affected environment at Shaw AFB and the potentially affected region. Based on the operational characteristics of the proposed action (Chapter 2.0), it was determined that the following resources could possibly be affected: airspace management, noise, safety, air quality, land use, biological resources, cultural resources, and socioeconomics and environmental justice. The existing environmental conditions within the expected geographic extent of potential impacts, known as the region of influence (ROI), are addressed for each environmental resource in this chapter.

### **3.1      AIRSPACE MANAGEMENT**

#### **3.1.1      Definition of the Resource**

Airspace management is the direction, control, and handling of flight operations in the volume of air that overlies the geopolitical borders of the United States and its territories. Airspace is a resource managed by the Federal Aviation Administration (FAA), which has established policies, designations, and flight rules around the airfield in Special Use Airspace areas identified for military and other governmental activities, and in other military training airspace. Airspace management considers how airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation.

The FAA has designated two types of airspace above the United States. They are Controlled, subdivided into classes A through E, and Uncontrolled (Class G) airspace. The airspace in the vicinity of Shaw AFB is Class C. Additionally, some airspace may be categorized as Special Use Airspace and Airspace for Special Use.

Special Use Airspace is designated where flight activities are conducted that require confinement of participating aircraft, or place operating limitations on non-participating aircraft. The three Restricted Areas, four Warning Areas, and eight MOAs managed and used by Shaw AFB aircraft are examples of Special Use Airspace.

Airspace for Special Use is non-special use airspace with defined dimensions wherein activities must be confined because of their nature, and/or wherein limitations may be imposed upon aircraft operations that are not part of these activities. Two Air Traffic Control Assigned Airspaces (ATCAAs) and the 25 MTRs managed and used by Shaw AFB are examples of Airspace for Special Use.

#### **3.1.2      Existing Conditions**

##### **3.1.2.1      CONTROLLED AIRSPACE**

In order to manage air traffic in the region, the FAA has designated airspace around Shaw AFB to support airfield operations as Class C (United States Department of Transportation [USDOT] 2001). This airspace extends upward from the surface to and including 4,200 mean sea level (MSL) within approximately five nautical miles (NM) of Shaw AFB but excluding that airspace below 1,500 MSL within a two mile radius of Sumter Municipal Airport, and that airspace extending upward from 1,500 feet to and including 4,200 feet MSL within a 10 NM radius of

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Shaw AFB, excluding that airspace contained within Restricted Area 6002 when it is in use (USDOT 2001; Shaw Air Force Base Instruction [AFBI] 11-250).

The airfield and tower at Shaw AFB are active from 6:00 AM to 10:30 PM Monday through Thursday; from 6:00 AM to 7:30 PM on Friday; and from 10:00 AM to 6:00 PM on weekends and holidays (Shaw AFBI 11-250). During FY 2001, more than 79,000 take offs, landings, and touch and go operations were conducted at Shaw AFB.

One public and one private airport lie within the controlled airspace. Sumter (public) airport lies approximately five NM east of the base. Creech, a private airfield, is situated just over five NM south of the installation.

One federal airway, V-56, transverses the controlled airspace in a generally northeast-southwest direction approximately three NM north of the airfield.

### 3.1.2.2 RESTRICTED AREAS

A Restricted Area is designated airspace that supports ground or flight activities that could be hazardous to non-participating aircraft. Entry into restricted airspace without approval from the using or controlling agency is prohibited. Aircrews from Shaw AFB perform air-to-ground training on the Poinsett ECR, located south of Shaw AFB. The restricted airspace, R-6002, is provided to support training activities on Poinsett ECR. This airspace is described in Table 3.1-1.

**Table 3.1-1. Restricted Area Identification and Description**

<i>Airspace</i>	<i>ALTITUDES</i>		<i>HOURS OF USE</i>		<i>Controlling ARTCC</i>
	<i>Minimum</i>	<i>Maximum</i>	<i>From</i>	<i>To</i>	
R-6002A	Surface	UTBNI 13,000 MSL	6:00 AM (Mon-Fri) 8:00 AM (Sat)	Midnight (Mon-Fri); 4:00 PM (Sat)	Jacksonville
R-6002B	13,000 MSL	UTBNI FL 180	6:00 AM (Mon-Fri) 8:00 AM (Sat)	Midnight (Mon-Fri) 4:00 PM (Sat)	Jacksonville
R-6002C	FL 180	FL 230	When Required	When Required	Jacksonville

UTBNI – Up To, But Not Including

FL – Flight Level. FL 180 is approximately 18,000 MSL

Source: USDOT 2001, Shaw AFBI 11-250, DoD Flight Information Publication, Special Use Airspace, AP/1A, 21 February 2002.

Under current conditions, approximately 5,200 sortie-operations are conducted in the Poinsett ECR restricted airspace annually, of which approximately 3,600 are contributed by aircraft from Shaw AFB.

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### **3.1.2.3 MILITARY TRAINING ROUTES**

MTRs are developed and used by the Department of Defense (DoD) to practice high-speed, low-altitude training, generally below 10,000 feet MSL. MTRs may be considered as flight corridors. They are described by a centerline, with defined horizontal limits on either side of the centerline, vertical limits expressed as minimum and maximum altitudes along the flight track. Military training missions performed using MTRs include low altitude navigation, surface attack tactics (SAT), and low altitude training (LOWAT) tactics. MTRs involved in this EA include those designated as IRs, which may be flown under Instrument Flight Rules (IFR) and VRs, which are flown under Visual Flight Rules (VFR).

IRs are mutually developed by DoD and FAA to provide for military operational and training requirements that were not otherwise permitted under FAA regulations because of aircraft speed. The FAA has issued a waiver to DoD to permit operation of military aircraft below 10,000 feet MSL in excess of 250 knots indicated airspeed along these mutually developed and established IR routes.

VRs are developed by DoD to provide for military operational and training requirements that were not permitted otherwise under FAA regulations because of aircraft speed.

Table 3.1-2 describes the MTRs that support military training from Shaw AFB. Appendix C provides additional information regarding each route.

These MTRs overlie portions of eight states: Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Along their tracks, the routes interact with other MTRs, Federal Airways, and airports. However, adverse interactions with other military and civil traffic are prevented by avoidance, horizontal and vertical separation, scheduling, and a basic rule of flight known as “see-and-avoid,” which is applicable to all military and civil pilots operating in any airspace.

Under current operations, approximately 9,400 sortie-operations occur on these MTRs annually, of which approximately 3,600 are contributed by aircraft from Shaw AFB.

### **3.1.2.4 MILITARY OPERATIONS AREAS**

A MOA is airspace established outside Class A airspace to separate/segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. MOAs exist so the military can conduct non-hazardous training activities, such as air combat maneuvers, air intercepts, acrobatics, low altitude tactics, etc. They contain these activities in airspace as free as practicable from nonparticipating aircraft. MOA utilization is under the control of applicable ARTCC. Shaw AFB manages the following MOAs, as described in Table 3.1-3.

**Table 3.1-2. Military Training Route Characteristics**

<i>Route Designation</i>	<i>WIDTH (IN NAUTICAL MILES)</i>		<i>ALTITUDES (IN FEET)</i>		<i>Length (In Nautical Miles)</i>
	<i>Minimum</i>	<i>Maximum</i>	<i>Minimum</i>	<i>Maximum</i>	
IR-002	10	10	100 AGL	9000 MSL	124
IR-012	3	10	500 AGL	3000 MSL	134
IR-074	4	20	100 AGL	7000 MSL	195
IR-089	6	10	100 AGL	7000 MSL	182
IR-090	6	10	100 AGL	10000 MSL	182
IR-721	0	10	300 AGL	8000 MSL	186
VR-1721 <sup>1</sup>	10	10	300 AGL	1500 AGL	186
IR-726	10	20	100 AGL	10000 MSL	144
VR-1726 <sup>1</sup>	10	30	100 AGL	1500 AGL	144
IR-743	10	10	100 AGL	9000 MSL	145
VR-1743 <sup>1</sup>	10	10	100 AGL	1500 AGL	145
VR-058 <sup>2</sup>	16	20	100 AGL	8000 MSL	196
VR-085	6	10	500 AGL	3000 MSL	134
VR-086	10	10	500 AGL	3000 MSL	205
VR-087	16	20	100 AGL	8000 MSL	183
VR-088	16	20	100 AGL	8000 MSL	164
VR-092 <sup>2</sup>	16	20	100 AGL	8000 MSL	196
VR-093	10	20	100 AGL	8000 MSL	209
VR-094	20	20	100 AGL	3000 MSL	150
VR-095	10	20	100 AGL	4000 MSL	227
VR-096	10	10	500 AGL	6500 MSL	143
VR-097	10	20	100 AGL	8000 MSL	327
VR-1059	7	20	100 AGL	1500 AGL	307
VR-1060	10	10	500 AGL	1500 AGL	239
VR-1061	10	10	500 AGL	1500 AGL	149

Notes: 1. Follows Same Ground Track As IR Listed Above

2. Same Ground Track / Opposite Direction Route

AGL - Above Ground Level

Source: DoD Flight Information Publication, Military Training Route AP/1B, 13 June 2002.

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**Table 3.1-3. MOA Identification and Description**

<i>MOA</i>	<i>ALTITUDES</i>		<i>HOURS OF USE</i>		<i>Controlling ARTCC</i>
	<i>Minimum</i>	<i>Maximum</i>	<i>From</i>	<i>To</i>	
Bulldog A <sup>1</sup>	500 AGL	UTBNI 10,000 MSL	7:00 AM	10:30 PM	Atlanta
Bulldog B <sup>1</sup>	10,000 MSL	UTBNI FL 180	7:00 AM	10:30 PM	Atlanta
Gamecock C	100 AGL	10,000 MSL	8:00 AM	10:30 PM	Jacksonville
Gamecock D	10,000 MSL	UTBNI 18,000 MSL	8:00 AM	10:30 PM	Jacksonville
Gamecock I	100 AGL	6,000 MSL	8:00 AM	11:00 PM	Jacksonville

Notes: 1. Bulldog A and Bulldog B are normally used together. Bulldog B overlaps all of Bulldog A and extends the higher altitude airspace to the south and east.

Source: USDOT 2001, USDOT 2002, DoD Flight Information Publication, Special Use Airspace, AP/1A.

The Bulldog MOAs overlie northeastern Georgia, the Gamecock C and D MOAs overlie eastern South Carolina, and the Gamecock I MOA overlies north central South Carolina.

The coincident portions of the Bulldog A and B MOAs overlie four airports. Two are civil and two are private. The portion of the Bulldog B MOA extending to the south and east overlies six airports. Three are private and three are civil. One Federal Airway, V-70, transverses the southeastern portion of the Bulldog B MOA in a northeast – southwest direction.

The Gamecock C MOA overlies one civil and one private airport. The Gamecock D MOA overlies two civil airports. One Federal Airway, V-437, transverses the Gamecock D MOA in a north-northeast to south-southwest direction. The Gamecock I MOA overlies two civil and one private airport, and lies immediately to the south-southeast of the Charlotte Terminal Area. One Federal Airway, V-155 transverses the MOA in a northeast to southwest direction.

When not required for other FAA air traffic control, ATCAA airspace above the Bulldog B and Gamecock D MOAs provides additional vertical airspace at, and above FL 180 when needed for higher altitude training tactics.

Under current operations, 18,577 sortie-operations occur in MOA airspace annually, of which 10,697 are contributed by aircraft from Shaw AFB.

### **3.1.2.5 WARNING AREAS**

A Warning Area is designated airspace which may contain hazards to non-participating aircraft. These designated airspace elements are located over the Atlantic Ocean as depicted on Figure 1-2. Table 3.1-4 describes the Warning Areas used by aircrews from Shaw AFB.

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**Table 3.1-4. Warning Area Identification and Description**

<i>MOA</i>	<i>ALTITUDES</i>		<i>HOURS OF USE</i>		<i>Controlling ARTCC</i>
	<i>Minimum</i>	<i>Maximum</i>	<i>From</i>	<i>To</i>	
W-161A	Surface	FL 620	Sunrise	1:00 AM	Jacksonville
W-161B	Surface	FL 240	Sunrise	1:00 AM	Jacksonville
W-177A	Surface	FL 500	Sunrise	1:00 AM	Jacksonville
W-177B	Surface	FL 240	Sunrise	1:00 AM	Jacksonville

Source: USDOT 2002

Warning Areas are used to support air-to-air training requirements. W-161 A/B covers approximately 2,398 square statute miles (1,810 square NM). It is located generally east of Charleston, off the coast of South Carolina. W-177 A/B covers approximately 3,507 square statute miles (2,648 square NM). It is located generally east of Myrtle Beach, off the coast of South Carolina. Both areas begin about 5 to 10 NM off the coast, and extend to the east between 50 and 85 NM from the coast. One high altitude Atlantic Route, AR-4, supporting enroute traffic to Charleston, transverses W-161A and W-161B in a west to east direction.

Under current conditions, 8,136 sortie-operations occur in the Atlantic Warning Areas, of which 4,730 are contributed by aircraft from Shaw AFB.

## **3.2 SAFETY**

### **3.2.1 Definition of the Resource**

This section addresses ground, explosive, and flight safety associated with operations conducted by the 20<sup>th</sup> FW stationed at Shaw AFB, South Carolina. These operations include activities at the airport itself, as well as training conducted in regional military training airspace. Ground safety considers issues associated with operations and maintenance activities that support base operations, including fire and crash response. Explosive safety discusses the management and use of ordnance or munitions associated with airbase operations and training activities conducted in various elements of training airspace. Flight safety considers aircraft flight risks such as aircraft accidents and bird-aircraft strikes.

The ROI for safety includes Shaw AFB and its immediate vicinity, as well as those areas encompassed by regional military training airspace used by aircrews from the 20<sup>th</sup> FW. This ROI includes the airport property and is expanded, on a limited basis, to include specific elements of military training airspace, and the lands underlying that airspace, in portions of South Carolina, Alabama, Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia.

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### 3.2.2 Existing Conditions

#### GROUND SAFETY

Day-to-day operations and maintenance activities conducted by the 20<sup>th</sup> FW are performed in accordance with applicable Air Force safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements.

The 20<sup>th</sup> FW fire department provides fire and crash response at Shaw AFB. The unit has a sufficient number of trained and qualified personnel, and possesses all equipment necessary to respond to aircraft accidents and structure fires. There are no equipment or facility shortfalls; there are no fire safety waivers in effect. The unit is also party to mutual-aid agreements with the Sumter Fire Department, thus ensuring availability of additional support if required (personal communication, Spitzer 2002).

Elements of the 20<sup>th</sup> FW fire department (firefighters and equipment) are assigned to Poinsett ECR. Strict adherence to all range operating processes and procedures has minimized fire risk on the range. Fire is not considered a significant issue at Poinsett (personal communication, Spitzer 2002).

Shaw AFB has two parallel runways. Runway 4L/22R is 10,010 feet in length and runway 4R/22L is 8,000 feet in length. Aircraft arresting systems are installed on each runway (Shaw AFBI 11-250). This is a mechanical safety system used to prevent an aircraft from overrunning the end of the runway should it be unable to stop on the runway for any reason. This system significantly minimizes crash risk in the immediate vicinity of the runways.

In the immediate vicinity of the airfield, the greatest ground safety risk concerns the results of an aircraft accident. To manage this risk, the Air Force analyzed over 800 major accidents that occurred over a 25-year period within 10 NM of the involved bases. As a result of these analyses, three planning zones have been established for use in the Air Installation Compatible Use Zone (AICUZ) program. These zones are: the Clear Zone (CZ), Accident Potential Zone (APZ) I, and APZ II.

The CZ extends 3,000 feet from the end of the runway(s), and 1,500 feet on either side of the runway centerline. APZ I extends 5,000 feet from the end of the CZ. APZ II extends this area an additional 7,000 feet. For CZs, the Air Force has adopted the policy of acquiring property rights through purchase or easement. The reduced accident potential in APZ I and APZ II does not warrant property acquisition by the Air Force. However, land use planning and controls in these areas are encouraged to reduce public risk.

Shaw AFB, although originally located in an open, remote, and largely undeveloped area is now beginning to experience some encroachment. Shaw's CZ is identified as a "substandard CZ." The Air Force only owns a 2,000-foot area of land. Shaw land use planners estimate an approximate 15 percent level of encroachment and associated incompatible land uses with the APZs, which include trailer parks and pockets of single family residential housing (personal communication, Hallmark 2002).

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In order to provide additional training realism, threat emitters are located at various ground locations under MOAs. These emitters transmit radio frequency signals that simulate “enemy” anti-aircraft defensive weapons systems, and require pilot response to “defend” the aircraft. Although these emitters operate and transmit in the radio frequency spectrum, safe operating procedures ensure that there is no risk to humans, and there have never been any radio frequency interference problems reported to Shaw AFB frequency managers (personal communication, Ellis 2002).

Aircrews training on Poinsett ECR are authorized to use laser targeting systems. Bioenvironmental Safety and Health Engineers have assessed the range, and have found no specific risk associated with laser use (personal communication, Harcarik 2002).

## **EXPLOSIVES SAFETY**

The 20<sup>th</sup> FW controls, maintains, and stores all ordnance and munitions required for mission performance. Ordnance is handled and stored in accordance with Air Force explosive safety directives (AFI 91-201), and all munitions maintenance is carried out by trained, qualified personnel using Air Force-approved technical data. Ample storage facilities exist, and all facilities are fully licensed for the ordnance they store. No storage facility waivers are currently in effect.

Due to proximity to the installation boundary, one safety arc in the munitions storage area extends off the east side of the installation. However, no waiver is required because the Air Force has established easements with the property owner to ensure protection of the area (personal communication, Blebins 2002).

Use of ordnance during training is normally limited to ranges within Restricted Airspace. Air Force safety standards require safeguards on weapons systems and ordnance to ensure against inadvertent releases. All munitions mounted on an aircraft, as well as the guns carried in the aircraft are equipped with mechanisms that preclude release or firing without activation of an electronic arming circuit. System malfunctions or materiel failures that could result in either an accidental release of ordnance, or the release of a dud component that fails to operate properly cannot be totally discounted. However, studies have shown that the probability of such an accidental release occurring, and then that injury to a person or damage to property on the ground would result is so infinitesimally small that the risk associated with the occurrence can be essentially discounted (Air Force 1999).

Currently, the 20<sup>th</sup> FW performs munitions delivery at Poinsett ECR. They deliver approximately 110,000 Bomb Dummy Unit (BDU)-33, approximately 1,200,000 20 mm training rounds, and approximately 80 inert bombs per year.

Chaff and flares are authorized for use in some of the military training airspace used by the 20<sup>th</sup> FW. Use is governed by detailed operating procedures to ensure safety, and use is limited to the Warning Areas over the Atlantic. Only training chaff (RR-188) is authorized for use during training (personal communication, Harper 2002). This chaff is specifically designed to avoid any interference with FAA air traffic control radars.



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Chaff is small fibers of aluminum-coated silica packed into approximately 4-ounce bundles and ejected by aircraft to reflect radar signals. When dispensed from an aircraft, chaff forms a brief “cloud” that temporarily hides the aircraft from radar detection. Although the chaff may be ejected from the aircraft using a small pyrotechnic charge, the chaff itself is not explosive. Chaff is composed of silicon dioxide fibers ranging in diameter from 0.7 to 1 mil (thousandth of an inch), coated by an aluminum alloy and a slip coating of stearic acid (fat). Analysis of the materials comprising chaff indicate that they are generally non-toxic in the quantities used (Air Force 1997). Silicon dioxide is an abundant compound in nature that is prevalent in soils, rocks, and sands. The trace quantities of metals included in the silica fibers are not present in sufficient quantities to pose a health risk. Aluminum is one of the most abundant metals in the earth's crust and water. In general, aluminum is regarded as non-toxic. Trace quantities of silicon, iron, copper, manganese, magnesium, zinc, vanadium, or titanium may be found in the alloy. The quantities involved are a minuscule percentage of levels that might cause concern. Stearic acid is found naturally as a glyceride in animal fat and some vegetable oils. Chaff has also been test-fired in a controlled environment to determine its potential to break down into respirable particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>). The findings of the test detected no PM<sub>10</sub> (Air Force 1997). Chaff has also been field tested to determine whether it could be resuspended. Chaff degraded rapidly with naturally occurring elements and was not found to resuspend into the atmosphere (Cook 2002).

Defensive flares consist of small pellets of highly flammable material that burn rapidly at extremely high temperatures. Their purpose is to provide a heat source other than the aircraft's engine exhaust to mislead heat-sensitive or heat-seeking targeting systems and decoy them away from the aircraft. The flare, essentially a pellet of magnesium, ignites upon ejection from the aircraft and burns completely within approximately 4.5 seconds (Air Force 1997).

In the event of any malfunctions or other safety issues involving ordnance, trained Explosive Ordnance Disposal (EOD) personnel are stationed at Shaw AFB. These technicians would render the component safe, and then manage its final disposition.

Currently, the 20<sup>th</sup> FW expends approximately 24,000 bundles of chaff and approximately 17,000 flares annually within the Warning Areas.

## **FLIGHT SAFETY**

The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of mid-air collisions, collisions with manmade structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military. Flight safety considerations addressed include aircraft mishaps and bird-aircraft strikes.

## **AIRCRAFT MISHAPS**

The Air Force defines four categories of aircraft mishaps: Classes A, B, C, and High Accident Potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of \$1 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class B mishaps result in total costs of more than \$200,000, but less than \$1 million, or

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result in permanent partial disability, but do not result in fatalities. Class C mishaps involve costs of more than \$20,000, but less than \$200,000, or a loss of worker productivity of more than eight hours. HAP represents minor incidents not meeting any of the criteria for Class A, B, or C. Class C mishaps and HAP, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public. This EA will focus on Class A mishaps because of their potentially catastrophic results.

It is impossible to predict the precise location of an aircraft accident, should one occur. Major considerations in any accident are loss of life and damage to property. The aircrew's ability to exit from a malfunctioning aircraft is dependent on the type of malfunction encountered. The probability of an aircraft crashing into a populated area is extremely low, however it can not be totally discounted. Several factors are relevant: the ROI and immediate surrounding areas have relatively low population densities; pilots of aircraft are instructed to avoid direct overflight of population centers at very low altitudes; and, finally, the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur.

Secondary effects of an aircraft crash include the potential for fire and environmental contamination. Again, because the extent of these secondary effects is situationally dependent, they are difficult to quantify. The terrain overflown in the ROI is diverse. For example, should a mishap occur, highly vegetated areas during a hot, dry summer would have a higher risk of experiencing extensive fires than would more barren and rocky areas during the winter. When an aircraft crashes, it may release hydrocarbons. Those petroleum, oils, and lubricants not consumed in a fire could contaminate soil and water. The potential for contamination is dependent on several factors. The porosity of the surface soils will determine how rapidly contaminants are absorbed. The specific geologic structure in the region will determine the extent and direction of the contamination plume. The locations and characteristics of surface and groundwater in the area will also affect the extent of contamination to those resources.

F-16 aircraft carry a small quantity of hydrazine in a sealed canister that is designed to withstand crash impact damage. Hydrazine is a highly volatile propellant that contains toxic elements. It is carried on the F-16 as part of the aircraft's emergency power unit. When used for this purpose, hydrazine is completely consumed, and poses no safety hazard. In any crash that is severe enough to rupture the canister, it is most likely that fire will also be involved. In this case, the hydrazine will also burn and be completely consumed. In the unlikely event that the hydrazine should be released, but not consumed by fire, impacts on soils and groundwater are likely to be of minor consequence. Hydrazine absorbs water at room temperature. It is incombustible in solution with water at concentrations of 40 percent or less, and it evaporates at any given temperature at a rate slightly slower than water. Movement of hydrazine through natural soils has been shown to be slow and limited. Due to its absorption and natural decomposition processes, the probability of released hydrazine significantly contaminating groundwater is considered extremely low. However, if quantities of hydrazine were to reach a

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surface water body, aquatic life in those areas experiencing high concentrations could be significantly impacted.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. It should be noted that these mishap rates do not consider combat losses due to enemy action. In the case of MOAs and restricted areas, an estimated average sortie duration may be used to estimate annual flight hours in the airspace. For MTRs, the length of the route and the average flight speed of the aircraft using the route may be used to determine the amount of flight time each specific type aircraft will spend on the route each year. Then, the Class A mishap rate per 100,000 flying hours can be used to compute a statistical projection of anticipated time between Class A mishaps in each applicable element of airspace. In evaluating this information, it should be emphasized that those data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

In the last five years, the 20<sup>th</sup> FW has experienced four Class A mishaps. One was in the vicinity of the airfield and three occurred in the military training airspace used by the unit. The incident at Shaw AFB was the result of an engine flame-out during takeoff. Of those that occurred in the training airspace, two were attributed to pilot error and one was a mechanical failure (personal communication, Carter 2002).

Aircrews from the 20<sup>th</sup> FW conduct training activity using 25 regional MTRs, five regional MOAs, two Warning Areas, and one weapons range (Poinsett ECR). Table 3.2-1 presents statistically projected Class A mishap data for flight operations conducted in these airspace elements. Shown, for each airspace element, are the numbers of F-16 aircraft currently using the airspace, levels of use, and the statistically predicted time between mishaps considering the mishap rates and levels of use. For F-16C aircraft, the lifetime Class A mishap rate is 3.6 per 100,000 flying hours (Air Force Safety Center 2001).

### **BIRD-AIRCRAFT STRIKE HAZARDS**

Bird-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher. However, most birds fly close to the ground. Over 97 percent of reported bird strikes occur below 3,000 feet AGL. Approximately 30 percent of bird strikes happen in the airport environment, and almost 55 percent occur during low-altitude flight training (Bird-Aircraft Strike Hazard [BASH] Team 2002).

The 20<sup>th</sup> FW has developed aggressive procedures designed to minimize the occurrence of bird-aircraft strikes. The unit has documented detailed procedures to monitor and react to heightened risk of bird-strikes (Shaw AFB 2001a), and when risk increases, such as during migration periods, limits are placed on low altitude flight, and some types of training (e.g., multiple approaches, closed pattern work, etc.) in the airport environment. Data maintained by the 20<sup>th</sup> FW Safety Office indicate that the greatest risk of bird aircraft strikes occurs during

**Table 3.2-1. Projected Class A Mishaps (Current Operations)**

<i>Airspace</i>	<i>Sortie- Operations per Year</i>	<i>Total Flight Time (Hrs) <sup>1</sup></i>	<i>Projected Years Between Mishaps (Years) <sup>1</sup></i>	<i>Airspace</i>	<i>Sortie- Operations per Year</i>	<i>Total Flight Time (Hrs) <sup>1</sup></i>	<i>Projected Years Between Mishaps (Years) <sup>1</sup></i>
IR-002	65	21	1,321.7	VR-094	126	49	565.3
IR-012	19	7	4,197.1	VR-095	250	148	187.8
IR-074	19	10	2,876.0	VR-096	10	4	7,440.5
IR-089	24	11	2,445.2	VR-097	186	158	175.4
IR-090	4	2	14,671.4	VR-1059	745	596	46.6
IR-721/ VR-1721	56	27	1,022.7	VR-1060	65	40	685.6
IR-726/ VR-1726	56	21	1,322.8	VR-1061	20	8	3,576.5
IR-743/ VR-1743	48	18	1,529.6	W-161	2,130	1,065	26.1
VR-058	128	65	425.5	W-177	2,600	1,300	21.4
VR-085	322	112	247.7	Bulldog A/B	6,056	3,028	9.2
VR-086	32	17	1,627.6	Gamecock C	862	431	64.4
VR-087	584	278	99.8	Gamecock D	3,667	1,833	15.2
VR-088	707	301	92.1	Gamecock I	112	56	496.0
VR-092	139	71	391.8	R-6002	3,646	1,823	15.2
VR-093	74	40	688.8				

Notes: 1. Numbers are rounded

Source: Air Force Safety Center 2001.

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March, April, and May, and again during August, September, and October (personal communication, Carter 2002). Historically, aircraft assigned to the 20<sup>th</sup> FW have been involved in an average of approximately 14 bird strikes per year. However, in recent years this number has decreased. Over the last five years, the average has reduced to 10.4 per year.

### **3.3 NOISE**

#### **3.3.1 Definition of the Resource**

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human response to noise varies according to the type and characteristics of the noise source, distance between source and receptor, receptor sensitivity, and time of day.

Sound is measured with instruments that record instantaneous sound levels in decibels (dB). A-weighted sound level measurements (often denoted dBA) are used to characterize sound levels that are heard especially well by the human ear. All sound levels analyzed in this EA are A-weighted; thus, the term dB implies dBA unless otherwise noted (Appendix B).

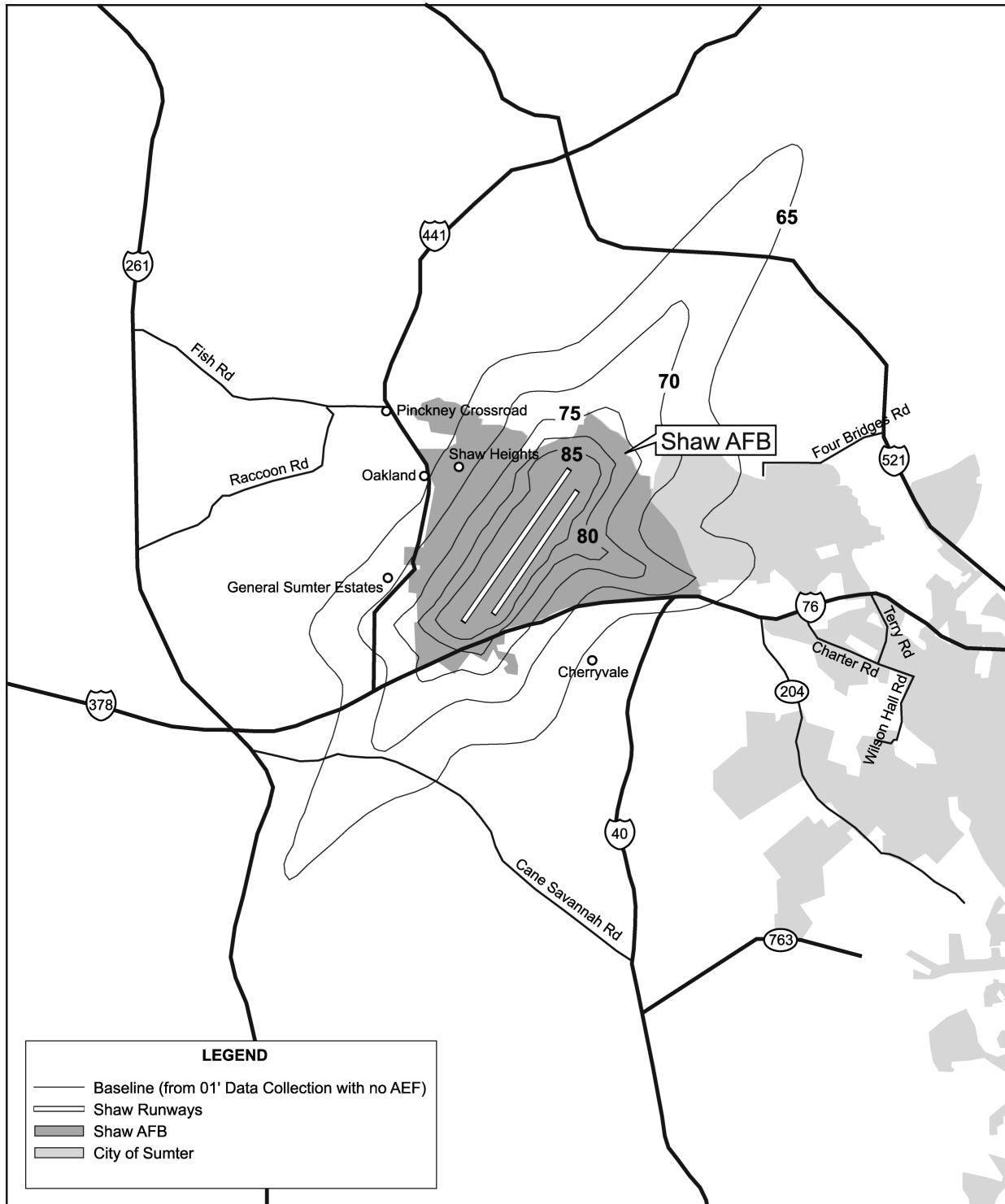
The ROI for this proposed action includes the base, local environs, and military training airspace. In this EA, single-event noise such as an overflight is described by the sound exposure level (SEL), airfield noise levels are measured in day-night average sound level (DNL), and airspace noise levels are calculated using the onset rate adjusted monthly day-night sound level ( $L_{dnmr}$ ). Both DNL and  $L_{dnmr}$  noise metrics incorporate a “penalty” for nighttime noise events to account for increased annoyance. A general discussion of these metrics is provided in Appendix B.

Noise contributions from aircraft operations and ground engine run-ups at Shaw AFB were calculated using the standard noise estimation methodology used for military airfields, NOISEMAP.

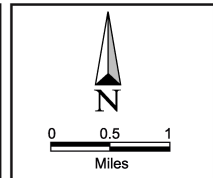
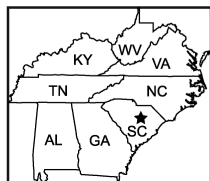
For existing operations (i.e., Alternative B, No-Action operations), noise levels were calculated for each airspace element (e.g., MOA or MTR) reflecting military training activities that occur in that airspace. Noise levels resulting from aircraft operating in the affected MOAs, Warning Areas, and MTRs were calculated with the Air Force noise-modeling program MOA\_Range Noise Map (MR\_NMAP). Resultant noise levels were based on the number of sortie-operations, time of day the sortie-operations occurred, altitudes of the aircraft during the sortie-operations, engine power setting, and airspeed. The noise assessment included all local and transient aircraft.

#### **3.3.2 Shaw Airfield**

The noise contours reflecting existing operations at Shaw Airfield are depicted in Figure 3.3-1. Existing contour areas are shown in Table 3.3-1.



**Figure 3.3-1**  
**Baseline Noise Contours at Shaw AFB**



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**Table 3.3-1. Existing Airfield Contour Areas**

<i>L<sub>dnmr</sub></i>	<i>Square Miles</i>
65	15
70	7.2
75	3.4
80	1.6

Source: Moulton 1990; Lee and Mohlman 1990.

Shaw Airfield supports over 79,000 annual aircraft operations as approaches, departures and closed patterns, as depicted in Table 3.3-2.

### **3.3.3 Existing MTR Noise Levels**

The Shaw region of influence for aircraft noise includes 22 MTRs comprising 8 IRs and 14 VRs. Each MTR is divided into multiple segments, and the existing noise levels may vary from segment to segment. Table 3.3-3 presents the calculated existing noise levels for all of the 22 MTRs affected by the proposed action. These noise levels represent the highest level in each MTR. The 22 MTRs show a range of  $L_{dnmr}$  values from 39 to 57 dB.

Operational directives for the MTRs provide avoidance areas to protect noise sensitive areas from excessive overflight noise. The noise modeling methodology makes appropriate adjustments for the associated relocation of MTR flight paths. The removal of these avoidance areas from direct overflight assures that noise levels in sensitive locations are lower than the MTR maximum noise levels reported in Table 3.3-3.

### **3.3.4 Military Operating Areas, Warning Areas and Restricted Areas**

As depicted on Figure 1-2, Shaw AFB utilizes MOAs, Warning Areas, and the Restricted Area overlying Poinsett ECR. These types of airspace support flight activities that are more random and involve a much greater range of altitudes than MTRs. Consequently,  $L_{dnmr}$  values are reported as average distributed noise levels, indicating the average noise level received on the ground for the entire airspace. The existing  $L_{dnmr}$  noise levels for these airspace units are presented in Table 3.3-4.

The indicated noise levels range from  $L_{dnmr}$  32 dB for the Gamecock D MOA to  $L_{dnmr}$  66 dB for R-6002. The land underlying R-6002 is owned and secured by the Air Force and uses thereon are compatible with the indicated noise level.

## **3.4 AIR QUALITY**

### **3.4.1 Definition of the Resource**

This section discusses air quality considerations and conditions in the area around Shaw AFB, South Carolina, and portions of the states of Alabama, Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia underlying the military training airspace used by

**Table 3.3-2. Existing Shaw Airfield Operations**

Aircraft	ARRIVAL		DEPARTURE		CLOSED PATTERNS	
	Day	Night	Day	Night	Day	Night
C-12	0.24		0.24			
F-16 (B)	42.39	1.3	42.39	1.3	103.83	
T-34	0.04		0.04			
A-10	0.1		0.1		0.67	
B-1	0		0		0	
B-57E	0.18		0.18			
C-5A	0.02		0.02		0.36	
C-9A	0.05		0.05		0.13	
KC-10	0.09	0.02	0.08	0.02		
C-17	0.05		0.05		0.25	
C-21	0.1		0.01			
C-130	0.07		0.06		0.3	
C-135	0.03		0.03			
C-141	0.02		0.01		0.05	
E-3	0.03		0.03		0.12	
F-15	0.18		0.18		0.69	
F-16	0		0		0.06	
F-16	0.45		0.45			
F-18	0.16		0.16		0.14	
T-2	0.08		0.07			
T-37	0.03		0.03			
T-38	0.04		0.04			
AV-8	0.03		0.05			
	44.38	1.32	44.27	1.32	106.6	0
Total Daily	45.7		45.59		106.6	
Annual Ops	11,882		11,853.4		55,432	
Total	79,167					

Source: Personal communication, Austin 2002.



**Table 3.3-3. Summary of No-Action  $L_{dnmr}$  Noise Levels for Shaw AFB Utilized MTRs**

<i>MTRs</i>	
<i>Airspace Unit</i>	<i><math>L_{dnmr}</math> (dB)</i>
IR-002	42
IR-012	48
IR-074	39
IR-089	41
IR-090	40
IR-721/VR-1721	48
IR-726/VR-1726	46
IR-743/VR-1743	44
VR-058	44
VR-085	57
VR-086	42
VR-087	51
VR-088	48
VR-092	42
VR-093	46
VR-094	42
VR-095	45
VR-096	50
VR-097	52
VR-1059	54
VR-1060	52
VR-1061	47

Source: Lucas and Calamia 1996.

**Table 3.3-4. Summary of No-Action  $L_{dnmr}$  Noise Levels for Shaw MOAs, Warning Areas, and Restricted Area**

<i>MOAs</i>		<i>WARNING AREAS AND RESTRICTED AREA</i>	
<i>Airspace Unit</i>	<i><math>L_{dnmr}</math></i>	<i>Airspace Unit</i>	<i><math>L_{dnmr}</math></i>
Bulldog A/B	51	W-161	50
Gamecock C	58	W-177	49
Gamecock D	32	R-6002	66
Gamecock I	50		

Source: Lucas and Calamia 1996.

aircrew operating from Shaw AFB. It addresses air quality standards and describes current air quality conditions in the region.

Air quality is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards. Under the authority of the CAA, the United States Environmental Protection Agency (USEPA) has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety. These federal standards, known as the National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations for six “criteria” pollutants: Carbon Monoxide (CO), Nitrogen Dioxide (NO<sub>2</sub>), Sulfur Dioxide (SO<sub>2</sub>), respirable particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>), Ozone (O<sub>3</sub>), and Lead (Pb) (40 CFR 50). Recent amendments have added a standard for particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>) that will be implemented over a period of time. Under the CAA, state and local agencies may establish ambient air quality standards and regulations of their own, provided these are at least as stringent as the federal requirements. For the regions of concern, Alabama, Georgia, and West Virginia have adopted standards identical to the federal standards. The standards adopted by Kentucky, North Carolina, South Carolina, Tennessee, and Virginia are also shown in Table 3.4-1.

The CAA of 1977 set provisions for the attainment and maintenance of the NAAQS. For non-attainment regions, the states are required to establish a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS by specific deadlines. Regional attainment plans are generally prepared by local agencies and incorporated into the overall SIP of the state.

CAA Section 176(c), General Conformity, established certain statutory requirements for federal agencies with proposed federal activities to demonstrate conformity of the proposed activities with the each state’s SIP for attainment of the NAAQS. In 1993, the USEPA issued the final

**Table 3.4-1. Applicable Ambient Air Quality Standards**  
(Page 1 of 2)

<i>Air Pollutant</i>	<i>Averaging Time</i>	<i>FEDERAL</i>		<i>KENTUCKY</i>		<i>NORTH CAROLINA</i>	<i>SOUTH CAROLINA</i>	<i>TENNESSEE</i>		<i>VIRGINIA</i>	
		<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Primary</i>	<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Secondary</i>
Carbon Monoxide (CO)	8-Hour 1-Hour	9 ppm 35 ppm	-- --	9 ppm 35 ppm	9 ppm 35 ppm	9 ppm 35 ppm	10 µg/m³ 40 µg/m³	9 ppm 35 ppm	9 ppm 35 ppm	9 ppm 35 ppm	9 ppm 35 ppm
Nitrogen Dioxide (NO <sub>2</sub> )	AAM 24-Hour	0.053 ppm --	0.053 ppm	0.05 ppm --	0.05 ppm --	0.053 ppm --	100 µg/m³ --	0.05 ppm --	0.05 ppm --	0.053 ppm --	0.053 ppm --
Sulfur Dioxide (SO <sub>2</sub> )	AAM 24-Hour 3-Hour	0.03 ppm 0.14 ppm --	-- -- 0.5 ppm	0.03 ppm 0.14 ppm --	-- -- 0.5 ppm	0.03 ppm 0.14 ppm 0.5 ppm	80 µg/m³ 365 µg/m³ 1300 µg/m³	0.03 ppm 0.14 ppm --	-- -- 0.5 ppm	0.03 ppm 0.14 ppm --	-- -- 0.5 ppm
Particulate Matter (PM <sub>10</sub> )	AAM 24-Hour	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³	50 µg/m³ 150 µg/m³
Particulate Matter (PM <sub>2.5</sub> ) <sup>1</sup>	AAM 24-Hour	15 µg/m³ 65 µg/m³	15 µg/m³ 65 µg/m³	-- --	-- --	15 µg/m³ 65 µg/m³	-- --	-- --	-- --	-- --	-- --
Total Suspended Particulates (TSP)	AGM 24-Hour	-- --	-- --	-- --	-- --	75 µg/m³ 150 µg/m³	75 µg/m³ --	-- --	150 µg/m³ --	-- --	-- --
Ozone (O <sub>3</sub> ) <sup>2</sup>	1-Hour 8-Hour	0.12 ppm 0.08 ppm	0.12 ppm --	0.12 ppm --	0.12 ppm --	-- 0.08 ppm	0.12 ppm --	0.12 ppm --	0.12 ppm --	0.12 ppm --	0.12 ppm --
Lead (Pb) and Lead Compounds	Calendar Quarter	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³	1.5 µg/m³
Hydrogen Sulfide	1-Hour	--	--	--	0.01 ppm	--	--	--	--	--	--

**Table 3.4-1. Applicable Ambient Air Quality Standards**  
(Page 2 of 2)

<i>Air Pollutant</i>	<i>Averaging Time</i>	<i>FEDERAL</i>		<i>KENTUCKY</i>		<i>NORTH CAROLINA</i>	<i>SOUTH CAROLINA</i>	<i>TENNESSEE</i>		<i>VIRGINIA</i>	
		<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Primary</i>	<i>Primary</i>	<i>Secondary</i>	<i>Primary</i>	<i>Secondary</i>
Gaseous Fluorides (HF)	AAM	--	--	0.5 ppm	--	--	--	--	--	--	--
	1 Month	--	--	--	1.0 ppb	--	0.8 µg/m <sup>3</sup>	--	1.2 µg/m <sup>3</sup>	--	--
	1 Week	--	--	-	2.0 ppb	--	1.6 µg/m <sup>3</sup>	--	1.6 µg/m <sup>3</sup>	--	--
	24-Hour	--	--	--	3.5 ppb	--	2.9 µg/m <sup>3</sup>	--	2.9 µg/m <sup>3</sup>	--	--
Hydrogen Chloride	12-Hour	--	--	--	4.5 ppb	--	3.7 µg/m <sup>3</sup>	--	3.7 µg/m <sup>3</sup>	--	--
	24-Hour	--	--	--	--	--	--	--	70 µg/m <sup>3</sup>	--	--

Notes: 1. The PM<sub>2.5</sub> standard (particulate matter with a diameter equal to or less than 2.5 microns) was promulgated in 1997, and will be implemented over an extended time frame. Areas will not be designated as in attainment or nonattainment of the PM<sub>2.5</sub> standard until the 2002 - 2005 timeframe.

2. The 8-hour Ozone standard was promulgated in 1997, and may eventually replace the 1-hour standard. The U.S. Supreme Court has instructed the USEPA to develop a reasonable implementation of the 8-hour nonattainment provisions. During the interim, the 1-hour ozone standard will continue to apply.

AAM = Annual Arithmetic Mean

ppm = parts per million

µg/m<sup>3</sup> = micrograms per cubic meter

ppb = parts per billion

AGM = Annual Geometric Mean

Sources: USEPA 2002a; Kentucky Ambient Air Quality Standards 2002; North Carolina Administrative Code 2002; South Carolina Ambient Air Quality Standards 1989; Tennessee Ambient Air Quality Standards 1999; Virginia Ambient Air Quality Standards 1999.

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rules for determining air quality conformity (40 CFR Parts 51 et al. in Federal Register November 30, 1999). Federal activities must not:

- cause or contribute to any new violation of a NAAQS;
- increase the frequency or severity of any existing violation; or
- delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment or maintenance area exceed annual thresholds identified in the rule, a conformity determination is required of that action. The thresholds become more restrictive as the severity of the nonattainment status of the region increases.

Class III areas are those designated by the governor of a state as requiring less protection than Class II areas. No Class III areas have yet been so designated. The Prevention of Significant Deterioration (PSD) requirements affect construction of new major stationary sources in the PSD Class I, II, and III areas and are a pre-construction permitting system.

CAA Section 169A established the additional goal of prevention of visibility impairment in the PSD Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The USEPA is in the process of implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions.

### **3.4.2 Existing Conditions**

The USEPA designates areas of the United States as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Section 162 of the CAA established the goal of PSD of air quality in all international parks; national parks which exceeded 6,000 acres; and national wilderness areas which exceeded 5,000 acres if these areas were in existence on August 7, 1977. These areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states or tribal nations, in addition to the federal government, have the authority to redesignate certain areas as (non-mandatory) PSD Class I areas, i.e., a National Park or national wilderness area established after August 7, 1977, which exceeds 10,000 acres. PSD Class I areas are areas where any appreciable deterioration of air quality is considered significant. Class II areas are those where moderate, well-controlled growth could be permitted.

The sections below identify the states and counties underlying the airspace and the county's attainment status, and identify any PSD Class I areas in relative proximity to the airspace such that aircraft operations could impact them.

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#### **3.4.2.1 ALABAMA**

The Alabama Department of Environmental Management (Air Division) manages the state's air quality. Jackson County is the only county in Alabama that underlies the training airspace. Jackson County currently attains all ambient air quality standards (USEPA 2002b).

There are no PSD Class I areas within 100 miles of any airspace element.

#### **3.4.2.2 GEORGIA**

The Air Protection Branch, Environmental Protection Division of the Georgia Department of Natural Resources has responsibility for the state's air quality. Training airspace used by aircrew operating from Shaw AFB overlies 72 Georgia counties. These are: Baldwin, Banks, Benhill, Berrien, Bibb, Bleckley, Bullock, Burke, Butts, Candler, Coffee, Columbia, Crawford, Crisp, Dade, Dodge, Dooly, Effingham, Elbert, Emanuel, Fannin, Franklin, Glascock, Greene, Habersham, Hall, Hancock, Hart, Irwin, Jackson, Jasper, Jefferson, Jenkins, Johnson, Jones, Lamar, Laurens, Lee, Lincoln, Lumpkin, Macon, Madison, McDuffie, Monroe, Montgomery, Oglethorpe, Peach, Pike, Pulaski, Putnam, Rabun, Schley, Screven, Sumter, Taliaferro, Taylor, Telfair, Toombs, Towns, Treutlen, Turner, Twiggs, Union, Upson, Warren, Washington, Wheeler, White, Wilcox, Wilkenson, Wilkes, and Worth. The NAAQS are attained in each of these counties (USEPA 2002b).

There are three PSD Class I areas in Georgia. However, all are located 25 miles or more from any of the involved airspace.

#### **3.4.2.3 KENTUCKY**

The Division for Air Quality, Department for Environmental Protection in the Natural Resources and Environmental Protection Cabinet has responsibility for the state's air quality. The military training airspace overlies 13 counties in Kentucky. They are: Bell, Breathitt, Clay, Floyd, Harlan, Knott, Knox, Leslie, Letcher, Magoffin, Owsley, Perry, and Pike. The NAAQS are attained in each of these counties (USEPA 2002b).

There are no PSD Class I areas near any of the airspace.

#### **3.4.2.4 NORTH CAROLINA**

The Environmental Management Division of the Department of the Environment and Natural Resources has promulgated ambient air quality standards for North Carolina. There are 71 North Carolina counties underlying the military training airspace. These counties are: Alleghany, Almage, Anson, Ashe, Avery, Beaufort, Bertie, Bladen, Brunswick, Burke, Caldwell, Camden, Caswell, Chatham, Chowan Dare, Columbus, Craven, Cumberland, Currituck, Davidson, Davie, Duplin, Edgecomb, Franklin, Granville, Greene, Guilford, Halifax, Haywood, Hyde, Iredell, Johnston, Jones, Lee, Lenoir, Martin, McDowell, Mitchell, Montgomery, Moore, Nash, North Hampton, Onslow, Orange, Pamlico, Pasquotank, Pender, Perquimans, Person, Pitt, Randolph, Richmond, Robeson, Rowan, Sampson, Scotland, Stanly, Stokes, Surry, Swain, Tyrrell, Union, Vance, Warren, Washington, Watauga, Wayne, Wilkes, Wilson, Yadkin, and Yancey. The NAAQS are attained in each of these counties (USEPA 2002b).

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There are five PSD Class I areas in North Carolina. Three MTRs (two groundtracks), IR-002, IR-743/VR-1743, are in the area of the Great Smokey Mountains National Park, and are within 15 miles of Shining Rock Wilderness Area. One MTR, VR-058, is located within five miles of the Joyce Kilmer-Slickrock Wilderness Area. IR-012 passes the Swanquarter Wilderness with approximately five miles. Two MTRs, (one groundtrack), IR-726/VR-1726, are located in the vicinity of Linville Gorge Wilderness Area.

#### **3.4.2.5 SOUTH CAROLINA**

The Bureau of Air Quality Control of the South Carolina Department of Health and Environmental Control regulates air quality in South Carolina. Shaw AFB and the Poinsett ECR are located in Sumter County. In addition to Sumter County, there are 42 South Carolina counties underlying the military training airspace. These counties are: Abbeville, Aiken, Allendale, Anderson, Bamberg, Barnwell, Beaufort, Berkeley, Calhoun, Charleston, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Dochester, Edgefield, Fairfield, Florence, Georgetown, Greenville, Greenwood, Hampton, Horry, Jasper, Kershaw, Lancaster, Laurens, Lee, Lexington, Marion, Marlboro, McCormick, Newberry, Oconee, Orangeburg, Pickens, Richland, Saluda, Spartanburg, Union, and Williamsburg. All 42 counties attain the NAAQS (USEPA 2002b).

The only PSD Class I area in South Carolina is separated from all of the training airspace by more than 20 miles.

#### **3.4.2.6 TENNESSEE**

Air quality standards in Tennessee are managed in accordance with the rules of the Tennessee Department of Health and the Tennessee Department of Environment and Conservation. There are 32 counties in Tennessee that are overflowed by the military training airspace. They are: Bledsoe, Bradley, Campbell, Cannon, Cocke, Coffee, Cumberland, DeKalb, Franklin, Grainger, Greene, Grundy, Hamblen, Hamilton, Hancock, Hawkins, Jefferson, Loudon, Marion, McMinn, Meigs, Monroe, Morgan, Polk, Rhea, Scott, Sequatchie, Sevier, Union, Clairborne, Van Buren, Warren, and White. All are in attainment of the NAAQS (USEPA 2002b).

Three MTRs (two groundtracks), IR-002 and IR-743/VR-1743, pass in close proximity to the edge of the Great Smokey Mountains National Park.

#### **3.4.2.7 VIRGINIA**

Ambient air quality standards for the Commonwealth of Virginia have been established by the State Air Pollution Control Board. There are 33 Virginia counties underlying the military training airspace. They are: Alleghany, Amherst, Appomattox, Bland, Botetourt, Brunswick, Buchanan, Buckingham, Carroll, Charlotte, Craig, Dickerson, Floyd, Franklin, Grayson, Halifax, Lee, Lunenburg, Mecklenburg, Montgomery, Nelson, Patrick, Pittsylvania, Prince Edward, Pulaski, Roanoke, Rockbridge, Russell, Scott, Smyth, Tazewell, Washington, and Wythe. All counties are in attainment of the NAAQS with one exception. In Smyth County, the portion of White Top Mountain above 4,500 feet MSL is in Marginal nonattainment for O<sub>3</sub> (USEPA 2002b).

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There are two PSD Class I areas in Virginia. However, only one, the James River Face Wilderness, could be potentially impacted by use of the training airspace. One MTR (VR-096) passes within approximately 10 miles of the area.

### **3.4.2.8 WEST VIRGINIA**

West Virginia's ambient air quality standards are established by the Office of Air Quality in the State's Division of Environmental Protection. The military training airspace used by aircrew from Shaw AFB only overlies two counties in West Virginia. They are: McDowell and Mingo. Both are in attainment for all criteria pollutants (USEPA 2002b).

The two PSD Class I areas in West Virginia are distant from any of the military training airspace and would not be impacted by aircraft operations.

### **3.4.3 Current Emissions**

Air emissions at Shaw AFB result from aircraft operations, operation of aerospace ground equipment, vehicular traffic, and from other stationary sources on the installation. Shaw AFB is classified as a "Conditional Major" emission source, and major stationary sources on the installation are operated under a Title V Operating Permit issued by the state of South Carolina. Table 3.4-2 summarizes the total emissions of criteria pollutants during 2001.

**Table 3.4-2. Existing Shaw Air Force Base Emissions**

<i>EXISTING POLLUTANTS (TONS PER YEAR)</i>					
<i>CO</i>	<i>SO<sub>2</sub></i>	<i>NO<sub>2</sub></i>	<i>PM<sub>10</sub></i>	<i>Pb Compounds</i>	<i>VOC</i>
19.5	7.2	43.6	2.0	0.005	11.2

Source: Shaw AFB 2001b.

## **3.5 LAND USE AND TRANSPORTATION**

### **3.5.1 Definition of the Resource**

The attributes of land use addressed in this analysis include land use and transportation. Land use focuses on general land use patterns, management plans, policies, ordinances, and regulations, and recreation resources on Shaw AFB and vicinity, as well as under the airspace. These provisions determine the types of uses that are allowable and identify appropriate design and development standards to address specially designated or environmentally sensitive areas. Transportation addresses roads and circulation on the base and vicinity.

### **3.5.2 Shaw AFB and Vicinity**

#### **LAND USE**

Shaw AFB is located within the city limits of Sumter, approximately ten miles west of the city center, as depicted on Figure 1-1. Land uses on Shaw AFB are grouped by function in geographic areas with the majority of the developed land uses occurring to the north and west of the airfield. Support services and the runway are located in the center of the base. The



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residential areas on base are located in the northwest portions of the base. Open space and light development including a munitions storage area and an outdoor recreation facility are located in the eastern portion of the base.

Adopted plans and programs guide land use planning on Shaw AFB. Base plans and studies present factors affecting both on- and off-base land use and include recommendations to assist on-base officials and local community leaders in ensuring compatible development.

The AICUZ Study (July 1994) for Shaw AFB recommends compatible land development patterns in the off-base areas subject to aircraft noise and accident potential. Section 3.2.2 of this EA discusses some encroachment issues within the designated CZ and APZs at Shaw AFB. Sumter County, in conjunction with Shaw AFB, has prepared a Joint Compatible Land Use Study (JCLUS) that incorporates AICUZ recommendations. The JCLUS also describes existing land uses; identifies encroachment areas around the base and Poinsett ECR; recommends modifications to the county zoning ordinance; addresses long-range infrastructure improvements; and describes twenty-year growth trends for the area (Robert and Company 1994).

The Shaw AFB General Plan provides an overall perspective concerning development opportunities and constraints and provides a framework for making effective programming, design, construction, and resource management decisions. The Shaw AFB 1994-2020 Comprehensive Plan provides goals for guiding and shaping development on base. The base's *Integrated Natural Resource Management Plan FY 2001-2005* (Air Force 2001) is used to coordinate natural resource management on the base and Poinsett ECR.

The city of Sumter is located in Sumter County in east central South Carolina (refer to Figure 1-1). Zoning around the base includes heavy industrial and limited commercial. Varying degrees of residential densities are permitted around the base and general commercial businesses are permitted along the major roads. To the north, northwest, and southeast, residential developments surround the base (Air Force 1996). On the major roads, including U.S. Highways 378-76 and 521 and State Route (SR) 441, commercial development occurs.

Land uses within Sumter County include agriculture and forestry, with over 50 percent of the county classified as prime farmland or farmlands of statewide importance (Air Force 1996). Special use areas in the vicinity of the base include Poinsett State Park, a portion of Woods Bay State Park, the Manchester State Forest (including a Wildlife Management Area [WMA]), and a portion of a 44,000-hectare Lake Marion impoundment are all within Sumter County.

Poinsett State Park is located in central South Carolina near Wedgefield, 18 miles southwest of Sumter. The park is located in an outlying area of the Sandhills, within the coastal plain. The park's terrain allows for diversity of plant and animal life. The facilities and activities include a campground, picnic shelters, nature center, hiking, equestrian, and biking trails, and fishing, swimming and boating (South Carolina Department of Parks, Recreation, and Tourism n.d.a).

Woods Bay State Park is located in eastern South Carolina, east of Sumter. The park sits off I-95 and US Highway 301, 3 miles west of Olanta. This 1,541-acre park features a geologic formation

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known as a Carolina Bay (South Carolina Department of Parks, Recreation, and Tourism n.d.b). Hiking, picnicking, and boating are all common activities.

Manchester State Forest, in Sumter and Clarendon Counties, consists of approximately 25,000 acres of mixed pine and hardwood species native to the midlands of South Carolina. The forest is managed to consider multiple uses including enhancing timber production, fish and wildlife habitat, air and water quality, soil conservation, scenic beauty, scientific research, and recreational opportunities. Manchester State Forest is included in the WMA Program through a cooperative agreement between the Department of Natural Resource and the South Carolina Forestry Commission (South Carolina Forestry Commission n.d.). Hunting and fishing with a permit/license are permitted.

## **TRANSPORTATION**

U.S. Highway 15 passes through the center of the city of Sumter and provides a north-south connection to the Interstate Highway system.

Access to Shaw AFB is provided through four security checkpoints as depicted on Figure 3.5-1. U.S. Highway 76/378, which passes along the southern boundary of the base, connects with Shaw Drive beginning at the main gate. Peach Orchard Road (SR 441) provides access to the base through the Hospital and Rhodes Gates. Frierson Road provides access to the base through the North Gate onto Sweeney Street.

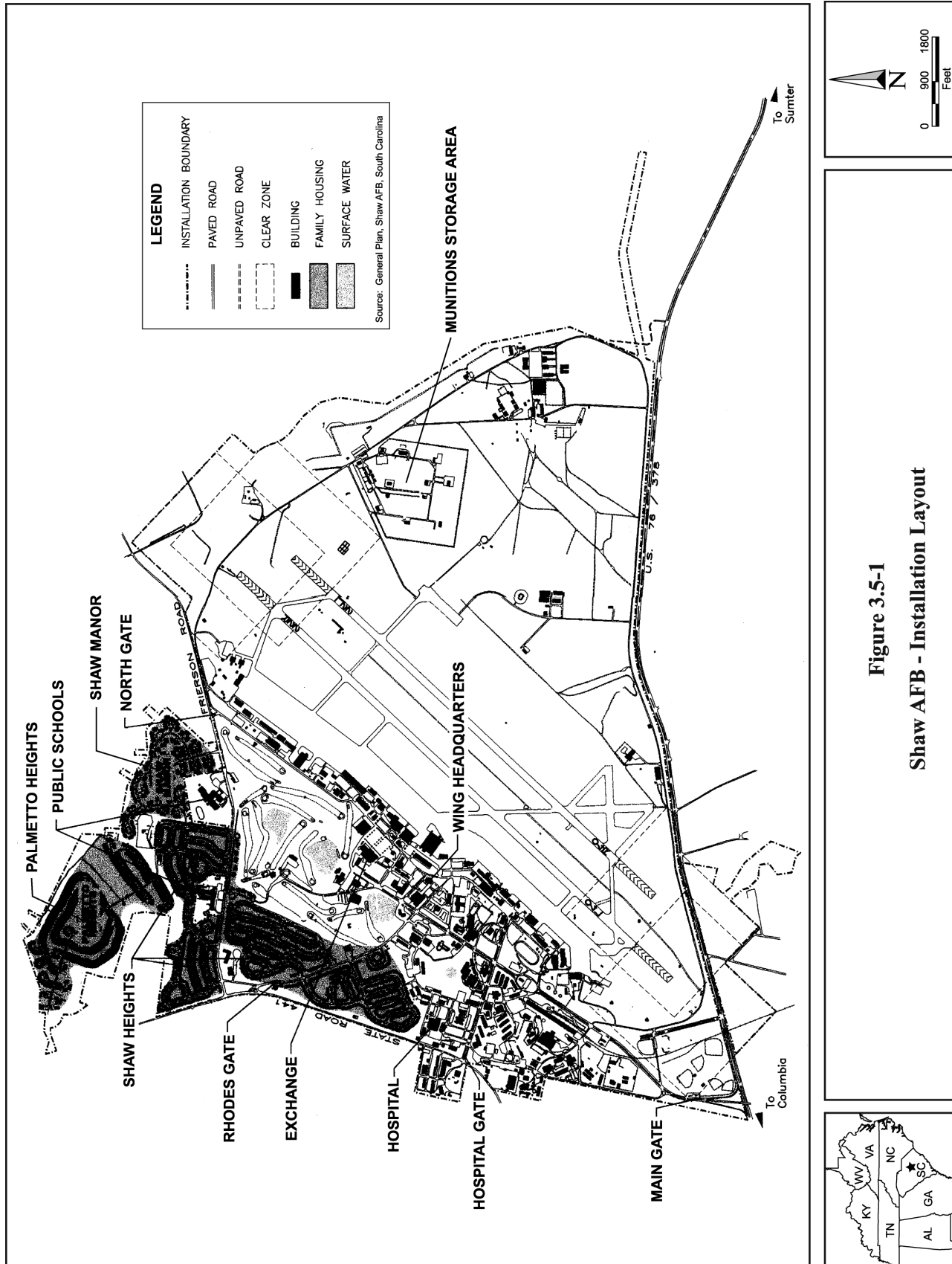
Shaw AFB has a network of streets that provide access to all base facilities. The major arterials include Polifka Drive, Rhodes Avenue, and Shaw Drive. Frierson Road bisects the installation on an east-west axis, separating the housing areas from the main cantonment area. The JCLUS yielded a variety of recommendations regarding safety (Robert and Company 1994). A left turn lane was recommended at the intersection of SR 441 and the Hospital Gate, and Frierson Road is viewed as a safety risk for the residents of the housing areas along the road.

### **3.5.3      Airspace**

As depicted on Figure 1-2, airspace associated with Shaw AFB includes restricted areas, MTRs, MOAs, and Warning Areas over a nine state area. A summary of land uses underlying the associated airspace is provided in Appendix C.

#### ***RESTRICTED AREAS/POINSETT ECR***

R-6002 (Poinsett ECR) is located in Sumter County, South Carolina. Primary land uses include agriculture and forestry. A portion of the Manchester State Forest, which permits hunting and timber harvesting, is under R-6002. Poinsett State Park is east of the range. Section 3.5.1 briefly describes the Manchester State Forest and Poinsett State Park.



**Figure 3.5-1**  
Shaw AFB - Installation Layout

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## ***MTRs***

Agricultural areas, forest lands and scattered rural communities in Alabama, West Virginia, Virginia, Tennessee, Kentucky, Georgia, North Carolina, and South Carolina occur under the MTRs. In addition, there are a variety of special use areas. These include national and state parks, forests, and historic areas; national wildlife refuges (NWRs); WMAs; and recreational areas on lakes, reservoirs, and rivers. Recreational activities in the special use areas primarily include camping, hiking, swimming, fishing, and boating. Appendix C describes the airspace unit and identifies underlying special use areas.

## ***MOAs***

The A and B portions of the Bulldog MOA are located in the middle-eastern section of Georgia over portions of Burke, Jenkins, Bulloch, Emanuel, Johnson, Washington, Glascock, and Washington counties. The primary land uses under the MOA include agriculture, forestry, and small rural towns. Magnolia Springs State Park is located under the MOA. The Fort Gordon Military Reservation is north of the MOA.

The B, C, and D portions of the Gamecock MOA are located in eastern South Carolina over portions of Williamsburg, Clarendon, Berkeley, Florence, Georgetown, and Marion counties. Agriculture, forestry, and small towns are the primary land uses under the MOA. The MOA is just outside the Santee NWR and Lake Marion. The Gamecock I MOA is located over portions of Kershaw, Lancaster, and Fairfield counties in north central South Carolina, and overlies portions of the Wateree Lake.

## ***WARNING AREAS***

Two Warning Areas over the Atlantic Ocean are also utilized by Shaw AFB (depicted on Figure 1-2). W-161 A/B covers approximately 2,398 square statute miles (1,810 square NM). It is located generally east of Charleston, off the coast of South Carolina. W-177 A/B covers approximately 3,507 square statute miles (2,648 square NM). It is located generally east of Myrtle Beach, off the coast of South Carolina.

## **3.6 BIOLOGICAL RESOURCES**

### **3.6.1 Definition of the Resource**

Biological resources include plants and animals within the region and the habitats in which they occur. All organisms and habitats occurring in one location comprise the ecosystem. Complex plant associations manifest as distinct vegetation communities and are driven by characteristics of precipitation, soil, hydrology, aspect, elevation, and climate, as well as competition among plant species and herbivory. Wildlife associations are driven by plant species composition and structure of the vegetation community and abiotic factors such as soil structure, topographic relief, water availability, and temperature. The base's *Integrated Natural Resource Management Plan FY 2001-2005* (Air Force 2001) provides information regarding biological resources at Shaw AFB and Poinsett ECR. Information regarding biological resources for this EA was largely derived from the *Utilization of Shaw Air Force Base Managed Airspace Environmental Assessment* (Shaw AFB 2001c).

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For purposes of this impact analysis, biological resources are presented in three categories: terrestrial communities, marine communities, and protected species. The ROI for biological resources includes Shaw AFB and the associated airspace.

### **3.6.2 Terrestrial Communities**

#### **SHAW AFB**

Shaw AFB is located in the southern evergreen forest of the South Carolina Coastal Plain. The base was commissioned in the 1940s and forested areas were cleared for development of the military installation. There is an undeveloped portion of the base that includes a dense 500-acre loblolly pine forest, planted in 1972, primarily as a noise break and visual barrier between the base and surrounding communities.

Wildlife on the base are widespread species that are habitat generalists or tolerant of disturbance. This includes a variety of species adapted to the southern evergreen forests. Mammals such as squirrels, rabbits, raccoons, opossum, and deer, as well as bird species including robins, sparrows, warblers, buntings, jays and crows, occur on the base.

#### **AIRSPACE**

#### ***POINSETT ECR AND RESTRICTED AREA***

Poinsett ECR lies in the southern evergreen forest of the South Carolina Coastal Plain. Upland areas and sand ridges are typically forested with longleaf and loblolly pines, oaks (live, red, white, and turkey), and hickory trees. Typical shrubs include wax myrtle, holly, bitter gallberry, and redbay. Typical vines include greenbriar, grapes, and yellow jessamine. Bottomland swamps along streams support trees such as cypress, sweet gum, tupelo gum, and tulip tree. Communities in Carolina bays and shrub-dominated wetlands (pocosins) are often dominated by pond pine, zenobia, titi, loblolly bay, and fetter bush. Several species of sphagnum are also common in pocosins and Carolina bays.

Wildlife on the Poinsett ECR includes a variety of species adapted to the southern evergreen forests. A variety of small and large mammals such as squirrels, rabbits, raccoons, possum, deer, bobcat, fox, and black bear are expected to occur on the range. Bird species include robins, sparrows, warblers, buntings, jays, crows, grackles, turkeys, hawks, and waterfowl. Alligators are also found in swamps in the vicinity of the range. (Refer to section 3.6.3 below for protected species.)

#### ***MTRs***

The affected MTRs overlie a large portion of the southeastern United States. The ROI extends from the high mountain forests of North Carolina and Virginia to the semitropical coastal habitats of South Carolina and Georgia. Along the high mountain peaks, birds and mammals characteristic of the spruce-fir forests of Canada are found. In the low country of South Carolina and Georgia, animals usually associated with Florida can be found. In the regions between these two extremes occurs most of the species found in eastern North America. Agriculture, including silviculture operations, is a significant component of the lands underlying the airspace involving cleared land, large tracts of vegetative monoculture and the introduction of

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large numbers of domestic livestock. Appendix C provides a brief description of each MTR and sensitive land use areas.

### ***MOAs***

Gamecock B, C and D MOAs overlie Williamsburg and Georgetown Counties in South Carolina. Gamecock I overlies portions of Kershaw, Lancaster, and Fairfield counties in North Central South Carolina. Bulldog A and B MOAs overlie several counties (Jefferson, Burke, Jenkins, Emanuel, Johnson, Washington, and Glascock) in northeast Georgia. Both of these areas consist of the southeastern evergreen forest association, and vegetation is similar to that described for Poinsett ECR (Air Force 1996).

The range of many species of mammals such as the least weasel, rock vole, and red squirrel follows the Appalachian Mountains through Virginia and West Virginia, finally occurring at the southernmost limits in the Great Smoky Mountains of North Carolina and Tennessee (Air Force 1996). The eastern spotted skunk ranges from the gulf states north along the Alleghenies to extreme southern Pennsylvania, while the striped skunk and the river otter range throughout the ROI. The black bear once occurred throughout the forested portions of the eastern United States, but now is restricted to the wilder, more remote portions of its range including the Appalachian Mountains. Other large mammals such as the bobcat and gray fox inhabit the mountainous regions of the ROI. White-tailed deer are distributed throughout the project area.

Many species of birds are residents in the Appalachians or follow the north-south trending range on their spring and fall migrations. Nesting birds such as the golden-crowned kinglet, red-breasted nuthatch, and black-capped chickadee reach the southern limits of their breeding ranges in the highest elevations of the Great Smoky Mountains and the Blue Ridge Mountains. Characteristic species of the deciduous forests on the middle, moist slopes include solitary vireo, black-throated blue warbler, and rose-breasted grosbeak. Lower, dry oak-dominated forests generally support a variety of small birds such as Carolina chickadees, tufted titmice, red-eyed vireos, hooded warblers, and scarlet tanagers. The concentration of spring and fall migrants occurs mainly along the coast, although several species of hawk such as Cooper's hawk, red-shouldered hawk, and broad-winged hawk migrate along the ridges and valleys of the Appalachians (Air Force 1996). Rich in swamps, rivers, floodplain forests, pine forests, and pocosins, the coastal plains of the southeast support a diverse and abundant assemblage of wildlife species. Swamp forests provide important wintering grounds for wood ducks and mallards. Inland freshwater marshes provide habitat for red-winged blackbirds, rails, various herons and egrets, and a variety of songbird species. Natural and manmade lakes provide excellent wintering habitat for waterfowl such as the Canada goose, whistling swans, and ducks, and in summer are important feeding and/or nesting grounds for birds such as the osprey and great blue heron. Important migratory routes for many waterbirds occur just off the eastern coast, and many shorebirds such as dunlins and plovers winter on the beaches of the southeastern United States. While pelagic birds such as shearwaters and petrels pass well offshore of the coast in fall and spring, birds such as loons and scoters migrate closer to and along the shores. Willits, American oystercatchers, Wilson's plovers, least terns, and black skimmers nest on the beaches. The barrier islands of the region provide a corridor for the

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migration of large numbers of land birds, including concentrations of a variety of hawks and the peregrine falcon. Common seagulls include herring gulls, ring-billed gulls, and laughing gulls.

### **3.6.3 Marine Communities**

Shaw AFB does not include marine habitat. However, Shaw AFB aircraft utilize Warning Areas that extend about 50 to 85 NM into the Atlantic Ocean. This part of the Atlantic Ocean is classified as cold temperate waters with a range of 5° to 20° C. Near-shore waters in this region are characterized by regular upwelling of nutrient-rich water caused by a deep bottom feature known as the Charleston Bump (Sedberry et al. 2001). As a result, phytoplankton production is high and supports a diversity of marine life. The area supports important fisheries for swordfish, grouper, tuna, sharks, and wreckfish. Seabirds present in the area include pomarine jaegers, parasitic jaegers, black-capped petrels, Cory's shearwaters, Audubon's shearwaters, Wilson's storm-petrels, northern gannets, sooty terns, and bridled terns (Tove 2000). Bottlenose and Atlantic spotted dolphins are found in coastal waters throughout the year (Tove 2000). A number of endangered and threatened whale and marine turtle species may also occur in this area and are addressed in section 3.6.4, Protected Species.

### **3.6.4 Protected Species**

Federal and state agencies have identified numerous threatened and endangered animal species that may occur in and/or beneath the proposed flight routes in the eight-state project area. Federal and state agencies were contacted for current lists of threatened, endangered, and special status species/communities. Letters were sent to the USFWS offices for Alabama, Georgia, Kentucky, Tennessee, South Carolina, North Carolina, Virginia, and West Virginia and specific state agencies (Alabama Wildlife and Habitat Management Office, Georgia Department of Natural Resources, Kentucky Department of Fish and Wildlife Resources, North Carolina Wildlife Habitat and Management Office, South Carolina Department of Natural Resources, Tennessee Wildlife Resources Agency, Virginia Branch of Fish and Wildlife Management, and West Virginia Department of Fish and Wildlife). A list of agency recipients and a sample contact letter are provided in Appendix A. Letters regarding protected species, provided by interested agencies, are provided in Appendix D. The area does not include critical habitat for any marine species.

### **SHAW AFB**

Several sensitive plant species occur in Sumter County, but none are expected to occur at Shaw AFB because the entire base was graded in the past. The endangered red-cockaded woodpecker (*Picoides borealis*) is known to occur near the base, but is not expected on the base because the 20 year-old pine forest is too young to provide sufficient habitat. Red-cockaded woodpeckers have been known to occasionally inhabit trees as young as 30 to 40 years old, but generally inhabit much older trees (Air Force 1996).

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## AIRSPACE (RESTRICTED AREA, MTRS, AND MOAS)

The red cockaded woodpecker is known to occur on Poinsett ECR (Air Force 1993). Data suggest that inhabited loblolly pines are typically 70 to 100 years old. In addition, most active colonies are found in open, park-like pine stands rather than dense forests (USFWS 1985). In accordance with the Integrated Natural Resource Management Plan, studies are ongoing at Poinsett ECR to assess the composition of the habitats present and to determine the presence or absence of several plant and animal species.

Based on a review of lists by these agencies, there are 17 terrestrial vertebrate animals that may occur under airspace associated with the proposed action. Because ground-disturbing activities would not occur under any alternative, the proposed action would not affect plants, invertebrates, or freshwater species, and only terrestrial vertebrates are considered further. Seven endangered and threatened bird species may occur in affected airspace, including bald eagle (*Haliaeetus leucocephalus*), wood stork (*Mycteria americana*), red-cockaded woodpecker, piping plover (*Charadrius melodus*), roseate tern (*Sterna dougalli*), Bachman's warbler (*Vermivora bachmanii*), and Kirtland's warbler (*Dendroica kirtlandii*). One threatened amphibian, the flatwoods salamander (*Ambystoma cingulatum*), and one threatened reptile, the eastern indigo snake (*Drymarchon corais couperi*), have potential to occur under airspace associated with the proposed action. Federally protected mammals with potential to occur include gray bat (*Myotis grisescens*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), Indiana bat (*Myotis sodalis*), and eastern cougar (*Felis concolor cougar*). An experimental population of red wolves (*Canis rufus*) also exists in eastern North Carolina. Two reptile species (bog turtle [*Clemmys muhlenbergii*] and American alligator [*Alligator mississippiensis*]) are protected on the basis of similarity of appearance to other listed species.

In addition to terrestrial wildlife, the National Marine Fisheries Service has provided a list of threatened and endangered marine animals that may occur in the Atlantic Ocean under Warning Areas 177 and 161 (Appendix D). Waters beneath marine airspace may support six species of endangered whales: blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), right whale (*Eubalaena glacialis*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). Five species of federally protected sea turtles potentially occur under these Warning Areas: green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempi*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

## 3.7 CULTURAL RESOURCES

### 3.7.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or other purposes. They include archaeological resources (both prehistoric and historic), historic architectural resources, and traditional resources. Only significant cultural resources (as defined in 36 CFR 60.4) are considered for potential adverse impacts from an action.



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Significant archaeological and architectural resources are either eligible for listing, or listed on, the National Register of Historic Places (National Register). Significant traditional resources are identified by Native American tribes or other groups, and may also be eligible for the National Register.

On 21 November 1999, the DoD promulgated its American Indian and Alaska Native Policy which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. The Policy requires an assessment, through consultation, of the affect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the services.

### **3.7.2 Existing Conditions**

#### **HISTORICAL SETTING**

Human occupation of the project region dates back at least 14,000 years when small groups of hunters ranged widely throughout the region. As the climate warmed, people began using a wide range of plant and animal resources over smaller territorial ranges (Shaw AFB 2001d). Population increased and eventually agriculture developed, providing the basis for village life. As agricultural use intensified, towns with public and sacred places and platform mound ceremonialism emerged in the region. Shaw AFB and Poinsett ECR are located in outlying areas where settlement consisted of camps and small farmsteads rather than towns (Shaw AFB 2001d).

Spanish exploration of the region began in early 1500s, leading to the establishment of a town near present-day Camden (Shaw AFB 2001d). England formed a government for the Carolina colonies in the late 1600s with settlement centering in the Charleston area. In 1701, four Indian groups were identified in central South Carolina: the Wateree (Sumter County); the Congaree (to the west); the Santee (to the south); and the Catawba (to the north) (Shaw AFB 2001d). These groups were loosely associated as the Esaw Confederation and fought the English settlers on the coast in the Yamasee War. Following the defeat of the Esaw Confederation, the site of the present-day Shaw AFB area was vacated except for occasional hunting use (Shaw AFB 2001d).

Regular contact between Euroamericans and Cherokees in the region began with the founding of the Carolina colonies (Sultzman 1996). A 1684 treaty with South Carolina initiated trade in deerskins and Indian slaves, and Cherokee warriors became hunters for profit (Sultzman 1996). European trade and competition aggravated rivalries among native groups, and friction increased between the Cherokee and surrounding native groups including the Catawba. British interests in the region supported a series of peace efforts culminating in a 1743 treaty between the Cherokee and Catawba (Sultzman 1996). Conflicts with the British eventually resulted in the Cherokee War of 1760 to 1762. After their defeat, the Cherokee signed a treaty with the South Carolina that ceded most of their eastern lands in the Carolinas. In 1838, the U.S. government forcibly removed many of the Cherokee from their lands. The Eastern Cherokee, living in the mountains of western North Carolina, were formally recognized by the U.S. in 1848 (Sultzman 1996). The Qualla Boundary reservation was chartered in 1889.

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Euroamerican settlers moved into Sumter County, beginning in the mid-1700s, to raise cattle and indigo. An influx of small farmers during Great Overland Migration of the 1750s and 1760s fully settled the colony. During the Revolutionary War, the Camden area was a British stronghold and skirmishes were fought throughout the countryside. After the war, when the indigo market collapsed, cotton became the crop of choice and African slaves soon outnumbered free men. Large plantations were established throughout the region. Civil War action took place largely outside the region until near the end of the war when “Potter’s Raid” attacked local railroads. After the Civil War, large plantations were replaced by smaller farms and logging operations.

Much of southwestern Sumter County, including present-day Poinsett ECR, was set aside as state park and federal forest in the 1930s. Shaw Field was established as an Army air base in 1941 in an area that was primarily agricultural fields (Air Force 1996). Shaw AFB acquired Poinsett ECR in 1951 and Wateree Recreation Area in 1959 (Shaw AFB 2001d).

## **CULTURAL RESOURCES**

### ***SHAW AFB***

There are no National Register-listed cultural resources at Shaw AFB (NRIS 2002). All of Shaw AFB, Poinsett ECR, and Wateree Recreation Area have been surveyed for archaeological resources. No resources have been identified at Wateree. On Shaw AFB and Poinsett ECR, 121 sites have been recorded. Twelve are eligible for the National Register, and 26 are potentially eligible (Shaw AFB 2001d). All eligible or potentially eligible sites are located on Poinsett ECR. Shaw AFB also has 23 historic architectural resources. Two of these, Rosemary Fire Tower and Building 611, are eligible for the National Register. The remaining architectural resources are ineligible for the National Register (Shaw AFB 2001d). No traditional resources have been identified on Shaw AFB lands (Shaw AFB 2001d). The federally-recognized tribe nearest to Shaw AFB is the Catawba Indian Nation, near Rock Hill, South Carolina.

### ***AIRSPACE***

Airspace proposed for this action extends over the states of Virginia, North Carolina, South Carolina, Georgia, Tennessee, and Kentucky. There are numerous cultural resources under this airspace, many of which are eligible for, or listed on, the National Register. Many Native American groups once lived in the states that are included in the ROI. However, most of these groups no longer exist or were forced by the U.S. government to move to Oklahoma and other states in the 19<sup>th</sup> century. Today, federally recognized Native American groups in the ROI are the Catawba Indian Nation located near Rock Hill, South Carolina (U.S Department of Commerce 2000) north of Gamecock MOA airspace; and the Eastern Band of Cherokee Indians, near Cherokee, North Carolina (U.S Department of Commerce 2000), in the vicinity of the southern part of IR-002/VR-1743. Additional detail on land use under airspace, including a listing of historic parks, is provided in section 3.5.1.

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## **3.8 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE**

### **3.8.1 Definition of the Resource**

The specific socioeconomic resource areas addressed include employment and earnings, population, housing and environmental justice. The ROI comprises Shaw AFB and the surrounding area, which encompasses Sumter County, South Carolina. Socioeconomic information is presented for the ROI and, where appropriate, comparisons are presented with conditions for the State of South Carolina. EO 12898 (Environmental Justice) requires analysis of the potential for federal actions to cause disproportionate health and environmental impacts on minority and low-income populations. Similarly, EO 13045 addresses protection of children from disproportionate environmental health and safety risks from federal actions.

### **3.8.2 Employment and Earnings**

In the ROI, total full- and part-time employment increased from 48,725 jobs in 1990 to 56,856 in 1999, at an average rate of 1.7 percent annually. The largest contributions to employment in 1999 were made by services (22.8 percent), manufacturing (22.0 percent), and government enterprises (21.7 percent). The sectors of the economy exhibiting the greatest relative increase in jobs over the period 1990-1999 were transportation and public utilities, services and manufacturing. For the years 1980, 1990, and 1999, the contribution of the military to total employment decreased from 13.5 percent to 12.9 percent and 9.7 percent, respectively (United States Department of Commerce, Economics, and Statistics Administration [USDCESA] 2000).

For the State of South Carolina, full- and part-time employment increased at an average rate of 1.9 percent annually between 1990 and 1999, at which time employment in the state was just over two million jobs. The sectors of the economy contributing the greatest number of jobs in the state over this period were services, retail trade, and manufacturing.

Total earnings in the ROI totaled over \$1.4 billion in 1999. Industries contributing the most toward job earnings included government enterprises (32.2 percent), manufacturing (24.2 percent), services (17.5 percent), and retail trade (8.69.4 percent). In South Carolina, total earnings amounted to \$63.7 billion in 1999. Average earnings per job in the ROI amount to \$25,896 while per capita income is \$18,238 (USDCESA 2000).

The number of military personnel stationed at Shaw AFB is approximately 5,412, with an additional 462 civilian workers. The value of payroll associated with government personnel at Shaw AFB reached over \$150 million in 1999 (personal communication, Hallmark 2002).

Shaw AFB purchases significant quantities of goods and services from local and regional firms. In 1999, non-payroll annual expenditures by the base were over \$130 million. The Air Force estimates that the economic stimulus of Shaw AFB accounts for approximately one-third of the general economic activity in the ROI, contributing a total annual economic impact of approximately \$500 million (personal communication, Hallmark 2002).

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### **3.8.3 Population**

The population of the ROI increased by 3.3 percent between 1990 and 2000 to a population of 104,646 persons in 2000. This increase took place at an average annual rate of 0.3 percent. By comparison, the population of South Carolina increased by 15.1 percent during the same period, reaching 4,012,012 persons in 2000 with an average annual growth rate of 1.4 percent between 1990 and 2000 (United States Bureau of the Census 2000). The Shaw AFB population, including government personnel and their dependents, currently amounts to approximately 7,000 persons (personal communication, Hallmark 2002). The majority of off-base military personnel and their dependents reside in the City of Sumter, with a 2000 population of approximately 43,000 persons. Like all military installations, Shaw AFB experiences shifts in population based on mission changes, deployments, and other operational considerations.

### **3.8.4 Housing**

There were a total of 41,751 housing units in the ROI in 2000, with a vacancy rate of about 9.6 percent. Almost 70 percent of the occupied housing units are owner-occupied (U.S. Bureau of the Census 2000). In 2000, there were 37,728 households in the ROI, with an average house size of 2.68 persons. Building permits for 294 residential units were issued in 2000, and so far in 2002, permits have been issued for 160 housing units. The majority (85 percent) of these units were comprised of single-family homes (U.S. Bureau of the Census 2002). Apartments are available in the local area with monthly rents ranging from \$350 to \$550 for a two-bedroom unit. Single-family homes are available for rent from \$450 to \$700 monthly.

Of the active-duty personnel assigned to Shaw AFB, about 50 percent reside on base in government family and unaccompanied housing. There are 1,702 military family housing units located on the base and approximately 900 dormitory spaces for unaccompanied personnel. Of the active duty personnel (and their dependents) who reside off base, almost 75 percent reside within Sumter County (the ROI) with the remaining personnel scattered throughout the region (personal communication, Hallmark 2002).

### **3.8.5 Environmental Justice**

Disadvantaged groups within the ROI, including low-income and minority communities, are specifically considered in order to assess the potential for disproportionate occurrence of impacts. Based on 2000 Census data, the incidence of persons and families in the ROI with incomes below the poverty level was comparable to state levels (U.S. Bureau of the Census 2000). In the ROI during 2000, 19.7 percent of persons and 26.9 percent of children were living below the poverty level, compared to 14.9 percent of persons and 23.0 percent of children in the state of South Carolina as a whole. It is likely that a number of the unaccompanied, lower-ranking enlisted personnel assigned to Shaw AFB are represented in the low-income population within the ROI.

Minority persons represent just over half the ROI population (50.6 percent). Black or African American persons account for almost all of the minority population in the ROI, representing 46.7 percent of the county population of 104,646 persons (or 92 percent of the minority

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population). By comparison, 33.9 percent of the state population is represented by minority persons (U.S. Bureau of the Census 2000).

The youth population age 18 and younger accounts for 28.1 percent of the ROI population, compared to 25.2 percent at the state level. The senior population, those individuals age 65 and older, account for 11.2 percent of the ROI and 12.1 percent of the state population (U.S. Bureau of the Census 2000).

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